

The **RISKY** Side of **RESPONSE**

INCREASING FATALITIES UNDERSCORE THE NEED FOR RECONCILED SAFETY PRACTICES OF GROUND & AIR AMBULANCES

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It's 1 a.m. in a rural county surrounding a mid-size American city. A sport utility vehicle driven by an intoxicated driver crosses the median and strikes a car head on, immediately killing the car's driver and seriously injuring her husband, the passenger. A local volunteer firefighter witnesses the accident and calls it in, triggering a full response to include a paramedic ambulance from the county service and a helicopter headquartered in the region. Help is on the way.

The scenario just described could have happened in any number of communities across the United States. Likely, the EMS personnel would arrive on scene by ground first and stabilize surviving patients for transport. Then, the air medical provider would arrive, continue the care and expedite transport by air to the local trauma center. The public would expect nothing less. Right?

Now consider this: The first-due ambulance was out on a call, so the next closest unit had to be sent from farther away. This is only their seventh call for the day, but they've already been on duty for 18 hours so far and have had some lengthy calls, with little time for recovery. The total response will be about 15 minutes with lights and sirens and take them through two bedroom communities, each with multiple intersections.

Now add this: Getting an air medical provider in the air took a little time. The first service declined the call because the pilot believed the weather wasn't conducive to a safe flight. Knowing the reported condition at the scene, the 9-1-1 dispatcher calls the next closest helicopter. It decides to take the call and is soon on the way.

As you consider the details occurring behind the scenes, the quality and safety of

the EMS system response to these patients becomes quite gray. You may be quick to think this couldn't be your system, but it very well could be. Absence of accepted standards, minimal oversight, misdirected market and public pressures, culture and tradition have an influence on the current state of the safety of ground and air medical transportation.

THE PROBLEM

The safety performance of air and ground EMS response is at the forefront now more than ever. In July 2005, *USA Today* alerted the lay public to a startling discovery: Since 2000, 60 deaths were related to the 84 air medical crashes—more than in the entire preceding decade.¹ With competition for service at its highest ever and the number of transports on the rise, these staggering numbers seemed unbelievable.

Along with the data from *USA Today*, also consider this lesser known data: In the most recent report from the National Highway Traffic Safety Administration (NHTSA) Fatality Analysis Reporting System, ambulance crashes in North America were queried from 1991 to 2002. During that 11-year period, roughly 300 fatal crashes occurred, resulting in the deaths of 82 ambulance occupants and 275 occupants of other vehicles or pedestrians—an average of 32.5 fatalities per year or three times that of air medical crash fatality rates. In May 2006 alone, at least 11 ambulance crashes in communities across North America resulted in 30 injured and the deaths of four people.²

We could examine the statistical rate of accidents for ground ambulances and medical helicopters—if there were such a database to reference. Although intuitively we may surmise that the rate of air medical

One study estimated that ambulance crashes resulted in an average of 32.5 fatalities per year—three times that of air medical crashes.



helicopter crashes is statistically lower than that of ambulances, neither crash rate is acceptable.

The transportation-related fatality rate for EMS providers (ground and air) (at 9.6 per 100,000 from 1992–1997) is three times that of the average worker (at 2.0 per 100,000 in 1995) and higher than other public safety partners (at 6.1 per 100,000 for police and 5.7 per 100,000 for firefighters from 1992–1997); representing the leading cause of on-the-job fatalities.³ With no national database, identifying estimated rates had to be extracted from three separate databases.³ This makes it difficult to appreciate how many crashes occur; how many result in a fatality; or how these rates compare with other data, such as miles traveled or call volume.

The air medical discipline is at an advantage when it comes to crash data because of its regulation and oversight under the Federal Aviation Administration (FAA). All incidents and crashes must be reported and are investigated by the National Transportation Safety Board (NTSB). This allows the FAA and the air medical industry to have a much more accurate understanding of the current state of its safety performance.

Why is that not the case for ground ambulance transport? NHTSA does not have the same regulatory powers as the FAA. When an ambulance crash happens, no regulated method exists for reporting details of the event. The investigating agency is often local or state law enforcement that may or may not be trained and experienced in the investigation of emergency vehicle crashes. Even if the event is documented, no single database exists for the data to be imported into.



Two of the key steps that can help change our safety situation are to appropriately use available safety technology and to encourage a “safety culture” to improve current response practices.

CRASH FACTS

With any discussion of ground and air medical transportation safety, it’s essential to understand leading factors that cause crashes. Are there similarities between ground and air medical accidents? Can these factors be reduced or eliminated through training, technology or improved safety culture and related process?

Logic would steer you to believe that most ambulance crashes occur during emergency response. You might also suspect crashes would occur more commonly in times of inclement weather or in times of glare, such as later in the day or at night, or on curves in the road.

Surprisingly, the Fatality Analysis Reporting System data doesn’t support our best assumptions. Approximately 60% of accidents ana-

lyzed in a study have occurred during emergent driving, but more than one-third (40%) have not. Common factors included traveling through an intersection; striking another vehicle; occurring in the afternoon; occurring on a dry, straight road; and occurring during normal weather conditions.⁴ None of these factors are unusual, and all should be avoidable through a focus on human factors, process improvement and basic technological assistance.

When it comes to the air, the factors attributed to crashes are different but have some similarities. The main difference, found during a study period from 1978 to 1998, is that 49% of helicopter-related crashes occur at night and a majority occur during on-scene-related flights versus hospital-to-hospital calls.

The most recent data reviewed shows weather as a significant factor in crashes and even more so at night. Seventy-five percent of crashes that occur because of weather result in a single fatality, and two-thirds result in a total loss of life.⁵ Although these statistics may surprise you, the characteristics probably do not.

Now look at some surprising characteristics of air crashes. The crash rate of air medical helicopters has increased from a rate of 1.7 per 100,000 hours for the period 1996–1997 to a rate of 4.8 per 100,000 hours during 2003–2004.⁶ One researcher reports that among the segments of a flight, the largest percent of crashes (32%) occur en route to the point of patient pick up. Further, 48% occur at night—and of these, 68% result in a fatality.⁷

Conversely, although 17% of the air medical crashes involve weather-related issues, the associated fatality rate increases eightfold.

Probably the most striking characteristic is the role of human error. Human error can be described as making poor decisions, failing to follow procedures or crews not communicating effectively during operations. Human error has been attributed to 65–76% of air crashes and, of those that resulted in fatalities, the percentage increases to 84%.⁵

The dominant finding from an accident investigation involves the driver/pilot. However, a number of potential factors lead to this finding, including initial and ongoing training, proficiency in operating the vehicle/aircraft, decision-making, crew communications and physical/emotional state.

One characteristic absent as an identified factor in both ground and air medical crashes is crew fatigue. Operators of ground ambulances are likely more at risk than pilots of a helicopter. Why? They have no restriction on the hours worked or the amount of recovery time required.

In many cases, EMS personnel work 24-hour shifts, which may or may not offer adequate recovery opportunities.^{8,9} In the air, Federal Aviation Regulations dictate that a pilot cannot be scheduled to work longer than 14 hours and must be scheduled for at least nine hours of rest between shifts.¹⁰

This restriction on pilot duty time was clarified and strengthened after a series of air medical crashes in the early 1980s. At that time, programs were staffed with three pilots (the standard now is four), many working 24-hour shifts and “timing out” during their shifts (placing the program out of service). Some air programs now expand the pilot duty time and rest requirement to include the medical crew, while other programs allow medical crews to work extended shifts but change out pilots every 12 hours. Ground EMS would benefit from adopting a similar mindset for duty/rest parameters for emergency vehicle operators.

CURRENT PRESSURES

Added attention to air medical crashes has placed public and consumer pressure on the air medical community to make immediate changes that will curb the number of accidents and decrease the number of fatalities. This has prompted the Association of Air Medical Services (AAMS) to take the lead and partner with the FAA, the NTSB and other associations to focus on key safety initiatives.

Although the media hasn't put the more dramatic statistics of ground crashes and fatalities directly on the doorsteps of Americans, ground EMS providers know there's a problem that requires action. The American Ambulance Association has been actively partnering with the EMS Division of NHTSA to discuss the current state of the problem and develop an understanding of the needs, including a national database of occupational injuries and illness. While efforts are ongoing, a roundtable of EMS safety stakeholders, experts and researchers was held this past summer to better determine which steps need to be taken.

A crucial first step will be to identify where current data exists, what the data reflects, what isn't collected or known, and then to get organizations to combine the data into a national database. These efforts will help the industry understand what the true need for data is and what must occur to facilitate getting to a point where the right data is accessible.

Although data on fatalities related to ambulance crashes may be reasonably accurate, the number of events and injuries will likely be an area requiring attention. The key is establishing the processes to get the most accurate data possible so the data can facilitate good future policy and decisions about safety initiatives.

Industry leaders on the ground and in the air are actively working with federal officials to ensure safety is a priority. These initiatives won't happen overnight and won't cause an immediate transformation of our safety problem, but they will plant the seed to significantly change the future of EMS safety. This doesn't mean, however, that the industry should just sit back and wait; several steps can be explored in the interim.

WHAT TO DO NOW

There are four key steps you and your organization can take in changing the current safety situation. These include getting involved in shaping the future, developing a safety culture, aggressively and continually training, and appropriately utilizing current safety technology.

Getting involved: Our natural tendency isn't always to roll up our uniform sleeves and get involved, but in this case, that's exactly what's needed. Safety is an issue with many factors to consider, which may be based on call volume, delivery type and market setting. It's important to get involved locally and federally as either a service operator or association member to ensure your perspective is heard and that all involved know it's an important issue to you and your colleagues. Those who show up to be part of the change are able to shape it and make sure it's accomplished in a way that meets the common need.

Training: Education and modeling safety practices are accessible to everyone in the industry. With human factors heavily contributing to crashes, and factors associated with crashes being somewhat predictable, beefing up training efforts has the potential to significantly impact the rate of incidence highlighted earlier. The right training can start today.



PHOTO PAUL TORRES

Nearly 85% of fatal air medical crashes are attributed to human error.

The skill and experience required to safely navigate an emergency vehicle in some of the most stressful conditions is immense. Guidelines from the Commission for Accreditation of Medical Transportation Services requires a pilot to have at least 2,000 total flight hours to include a minimum of 1,500 helicopter flight hours (1,000 of those hours must be as pilot in command in a helicopter, and at least 100 of those hours must be unaided night-flight time as the pilot in command). Further, there are requirements for EMS pilots' initial training and monthly and annual recurrent training minimums that include didactic and flight times, as well as annual check rides.

Safely and effectively driving an ambulance also requires skill, experience, and knowledge above and beyond that gained from being an average vehicle operator. However, no comparable minimum number of hours of driving experience or ongoing requirements has been established.

Recognizing this, many services require some form of emergency vehicle operator course (EVOC) at the start of employment. However, this training is not mandated by state or federal regulation and, in many cases, there's no refresher or follow-up training unless an EMT is involved in a crash. It's not uncommon for EMS personnel to have more exposure to CPR training than they do to emergency driving, even though not being knowledgeable in managing either can result in death and they're much more likely to experience greater frequency driving than performing CPR.

Safer culture: In addition to training people how to safely operate ground or air medical transportation devices for driving or flying, we must develop a safety awareness and culture. In the air medical environment, it's considered critical that the pilot and crewmembers all rely on each other to be on the look out for safety issues and to speak up if they see anything of concern. The FAA regulates that all pilots participate in crew resource management (CRM) training, which is a program that evolved out of identifying key communication issues from major air disasters, as well as NASA research.

The air medical community has extended responsibility for the safety of missions further through Air Medical Resource Management (AMRM), which brings the entire organization onto a common foundation for communicating, decision-making, workload management and situational awareness.

Pilots, medical crew, communications specialists, mechanics and program management undergo annual training together to help improve teamwork before, during and after each mission. The joint training teaches people to use all available resources to ensure safety, including instruments, technology and crewmembers. This goal is to take a system approach to safety and not allow poor and disastrous decisions to be made if they can be avoided. This creates a unique joint responsibility toward the safety culture.

In the ground EMS environment, there's no equivalent to AMRM. Although a partner who is riding shotgun while responding to a call may tell the driver if they're "clear to the right" or act as an extra set of eyes, no established or regulated safety management program or culture exists. When the partner is in the back with the patient, the driver is completely alone. Many potential air crashes or events might have, or have been, avoided with the establishment of a safety culture. Ground EMS needs to follow suit; if it does so, it might experience similar improvements in safety.

Technology adjuncts: In addition to addressing human factors and processes, technological innovations have provided hope for improving safety.

Promising adjuncts introduced to ground EMS include products that provide driver monitoring and feedback. These devices track mileage, speed, braking and cornering, and provide feedback when drivers exceed established acceptable limits. They also allow administrators the ability to conduct effective assurance on driving performance.

A prospective study looking at the implementation of one such device in an urban EMS system saw dramatic reduction in "penalty counts," an increase in seat-belt use, and witnessed a 20% savings in vehicle maintenance without noting any decrease in response time reliability.¹¹ These devices seem to offer encouraging results in improving driver behavior.

In the aero-medical industry, people have also looked to technology to enhance safety. Night vision goggles, radar altimeters, terrain-awareness and warning systems, and proximity are all being considered as adjuncts to improving human factors and this increasing the safety of flight operations.

As with the ground environment, however, the concern exists that people will look to technology as the answer and miss that preventable and trainable human factors are the leading cause of many of the crashes that occur. Although these adjuncts can help, it's important to appreciate that the causes of crashes start with human factors. Technology should not be pursued in place of educating personnel and establishing safe processes and a safety culture.

By getting involved in shaping the safety initiatives currently in progress, redirecting your training efforts, continuing to evolve the safety culture and intelligently using technological adjuncts, you have the ability to make an impact today. These efforts will complement further changes to come down the line as the industry as a whole searches for greater answers and establishes smarter policies and practices. Your actions today will make future improvements more dramatic.

CONCLUSION

Whereas any air medical incident or accident draws immediate attention, a similar occurrence involving a ground ambulance

has not yet reached that level of public scrutiny. The air medical community has launched a bold program committed to reducing errors of consequence, Vision Zero (see <http://visionzero.aams.org>). Quite simply, it's an initiative to reduce and eliminate from the air transport environment those events that result in serious injury or loss of life. Vision Zero is an open statement to the public that communicates accountability, and responsibility, to deliver safe and effective medical transportation services.

Ground ambulance providers have a similar objective, and should continue to develop internal assessments and solutions directed toward a safer EMS response, while working collaboratively with the air medical community in securing the public's confidence in the safety of all modes of medical transportation. [JEMS](#)

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